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ABSTRACT

Banks are usually reimbursed for their checking account services either by a fixed service charge or by requiring a minimum or minimum-average compensating cash balance. This paper demonstrates how to determine the optimal minimum balance for a school district to maintain in its account. It is assumed that both the bank and the school district use the Miller-Orr cash management model and that not maintaining a minimum compensating cash balance will result in charges for approximately 99 overdrafts a year. Calculations presented for a sample school district indicate that the district should not maintain a minimum compensating cash balance but should negotiate an annual fee to compensate the bank and invest the funds that previously constituted the cash balance. The paper concludes that the use of negotiated bank charges, short-term lines of credit, zero minimum checking balances, and investment of cash balances in short-term investments could result in thousands of additional dollars for school districts. (Author/JM)

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The Effect of the Minimum Compensating Cash Balance on School District Investments

by

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School districts, like other public institutions, have cash flows which offer opportunities for short term investments. Revenues for school districts are primarily derived from local property taxes and state aid. Property taxes are collected and distributed to school districts once or twice a year in large lump sums. State aid is received monthly or bimonthly. Expenditures, primarily employee salaries, flow at a more uniform rate throughout the period. As a result, school districts often experience periods in which there are excess revenues compared to expenditures. These excess funds are available for short term investment. For a variety of reasons, however, cash available for investment by school districts is seldom fully invested.

There are several reasons why school districts do not, or cannot, fully invest their excess funds. One of these reasons is the compensating balance requirement of the school district depository bank. School districts usually make payments to employees and vendors by check. The bank incurs expenses in servicing these checking accounts. These expenses are primarily labor costs of performing various tasks required to service checking accounts, such as check reconciliation, accepting deposits, and check clearing. Banks usually are reimbursed for these expenses by charging a fixed fee to cover these expenses, or by requiring that a minimum or minimum-average cash balance be maintained in the checking accounts.

In determining how much of a fee to charge or at what level to set the minimum balance requirement, a bank performs a "pro-

fitability" analysis of the checking account. This paper will present how the bank of a selected school district determines the profitability of the school district account, and how it uses this analysis to set the fee requirement and the minimum compensating balance requirement. This "profitability" analysis procedure will then be incorporated in a computer simulation of the cash management behavior of a school district which uses a cash management system based on the Miller-Orr cash management model.[1] The Miller-Orr cash management model consists of a set of formal and heuristic procedures which are used as a decision-making tool in the management of working capital. This simulation is used to determine the optimal level of the compensating balance requirement and fee structure for the school district to negotiate with the depository bank.[2]

In determining what a checking account costs a bank to service, a number of steps are used. For example, for a selected school district, the expenses for a five month period to the bank in servicing the checking account were determined as follows. Using standard prices, the total expenses for a five month period were:

Number of checks 17,646 @ $.10 each	$1,764.60
Number of deposits 6,094 @ $.05 each	304.70
Fixed monthly charge:	
(1 account x 5 months x $2.00 per account/month	10.00
Stop payment requests 11 @ $4.00 each	44.00
Master Charge Sales 208 @ $.95 each	197.00
Check reconciliation fees:	
$.01 for first 1000 per month (3 months only)	30.00
$.015 per check per month	219.69
Total Expenses	$2,569.99

Once a bank estimates these charges or expenses of servicing the school district accounts, it then determines whether there is a net profitability for the bank by calculating the earnings allowance of the account. The earnings allowance for the checking account is determined as follows. First, the bank records showed that for the five month period in question, the gross average daily balance for the checking account was $359,200. In order to meet liquidity requirements, in determining the earnings allowance, the bank stated that only 75 per cent of this cash balance was available for investment. Thus, the bank could invest $269,400 of the $359,200. The bank then stated that it could earn only 2.4 per cent annual interest on this money by investing it. Thus, for the five month period, the bank determined that it could earn $269,400 x 5/12 x 0.024 per cent or $2,694 in interest on the school district account. The net profitability of the checking account is equal to the earnings allowance credit minus the account expenses, or $2,694 - $2,570 = $124.00. Thus the bank would be making a profit of $124 for the five month period, or $297.60 annually. In addition, the bank is charging the school district $870 annually as a fee for banking services, a profit of $1,168 annually after expenses.

The bank did not explain how the charges for the various services that were provided to the school district were determined, other than stating that these charges were standard prices charged by most banks. Further, the bank did not justify its earnings allowance determination of only being able to invest 75 per cent

of the cash balance of the account, and being able to earn only 2.4 per cent annual interest on investments. However, it is not the purpose of this paper to investigate what these charges should be. This method of determining "profitability" of accounts will be accepted as given, and used in a computer simulation of a cash management system of the sample school district. The computer simulation will assume that the sample school district uses the Miller-Orr cash management model as the basis of its cash management system.[3]

The Miller-Orr cash management model is used to determine upper and lower limits to which the cash balance in the checking account will be allowed to reach. These cash balance limits are calculated by the use of a formula which uses the variability of the changes in the daily cash position of the school district. Generally, the higher the variability of the changes in the cash position, the higher the upper boundary will be. The lower boundary to which the cash balance will be allowed to attain is the compensating balance requirement set by the bank of the school district. At times, however, the cash balance in the checking account goes below the lower limit. If the checks cashed on that day exceed the daily cash balance, the checking account becomes overdrawn. Through the use of the Miller-Orr model, the optimal amount of cash to be left in the checking account is determined. The remainder of the excess cash over expenditures is assumed to be invested in a daily savings account earning 5 per cent annual interest. It follows that the higher the compensating

balance requirement of the depository bank of the school district, the less money can be invested by the school district in interest earning assets.

Formally, the Miller-Orr cash management model is stated as follows:

$$z = \left(\frac{3\ Y\ m^2 t}{4v}\right)\ 1/3$$

where: z is the amount of cash that should be in the checking account after all transactions between the checking and savings account. This amount of cash is in addition to the minimum balance requirement of the bank.

Y is the transactions cost of transferring money from the checking to savings account or vice versa.

m is the average daily change in the cash balance over the year.

t is the number of times per day when there are changes in the cash balance. Since banks typically only clear checks once a day, t = 1.

v is the daily interest rate of the savings account, estimated at .00014 per cent.

The lower limit to which the daily cash balance in the checking account will be allowed to reach is the minimum compensating cash balance requirement of the depository bank. The upper limit to which the cash balance is allowed to wander (h) is equal to 3z. Putting the Miller-Orr cash management model into operation, a business manager would call the bank every morning to determine the school system's cash balance in the checking account. Assuming that z = $139,000; then h = 3z = $417,000. If the minimum compensating cash balance is $0, and the cash balance in the checking account is larger than the upper limit of $417,000, the business manager would transfer enough cash to the savings

account from the checking account so that the cash balance is equal to z or $139,000. If the cash balance is in between the upper and lower cash limits (in this case $417,000 and $0), the business manager would make no cash transaction. If the cash balance is below the minimum cash balance limit, the business manager would transfer sufficient money to the checking account to bring the cash balance back to the return point (z) or $139,000.[4]

Using the Miller-Orr cash management model-based cash management system, the effect of the minimum compensating balance on the investment potential of a school district was investigated. The school district had annual expenditures of $30,000,000, with an average daily balance in the checking account of $142,000. A computer simulation was developed which reconstructed the cash flow and cash management operation of the sample school district using the revenue and expenditure data of the district. Transfers of cash between the investment portfolio (savings account) and the checking account of the school district were made using the decision parameters as determined by the Miller-Orr cash management model, i.e. z = $139,000, h = 417,000, and the lower boundary was the compensating balance requirement of the depository bank of the school district. Only the compensating balance requirement was variable, ranging from $0 to $300,000. The effect on the interest earnings of the school district due to differences in the compensating balance level were determined. Table 1 displays the results of the simulations.

As shown in Table 1, the setting of the compensating balance

TABLE 1

The Effect of the Minimum Cash Balance Requirement on Interest Earnings

Minimum Cash Balance Requirement	Average Daily Balance	Overdraft Charges	Annual Fee	Total Costs	Savings Interest Earned	Net Gain	Number of Checkirg Overdrafts
$ 0	$ 76,094	$2,188	$5,495	$7,683	$75,516	$67,833	99
50,000	124,585	1,322	4,622	5,944	73,654	67,710	62
100,000	171,491	853	3,778	4,631	71,879	67,248	27
200,000	271,201	657	1,983	2,640	66,879	64,239	1
300,000	367,328	657	253	910	61,868	60,958	1

level has a substantial effect on the cash flow and interest earning ability of the school district. The average cash balance in the checking account of the school district rises substantially as the compensating balance level increases. One effect of the lower levels of compensating cash balance is that the school district experienced higher levels of overdrafts in the checking account. To take account of these overdrafts, the simulation then was modified to assume that any overdrafts incurred would be covered by the bank at an 8 per cent annual fee. This low annual borrowing rate of interest results because the loan to the governmental unit is tax free for the bank. Thus, in Table 1, the number of overdrafts and the overdraft charges incurred by the school district are listed. In general, as the level of compensating cash balance increases, the number of overdrafts decreases.

Using the described procedure, the annual fee that would be charged to the school district by the bank for its services was determined. The sample school district used a total of 42,350 checks for the 1975-76 fiscal year. Using the "standard" prices for banking services listed previously, it was determined that each check cost the bank $.1621 to handle. Thus, the total expense to the bank for handling the checks of the school district would be 42,350 x $.1621 = $6,865. It was assumed that the school district has to compensate the bank $6,865 annually for its services. The district may do this by maintaining a minimum compensating balance level in the checking account, pay-

ing an annual fee, or by a combination of the balance and fee.

If the school district chose to maintain a $0 minimum compensating cash balance in its checking account, it would have maintained an average daily cash balance of $76,094 as calculated by the computer simulation program. The bank of the sample school district stated that it could only have invested 75 per cent of that daily cash balance at 2.4 per cent annual interest. While this earnings capability is questionable, it will be accepted as valid for this study. Thus, the bank could earn .75($76,094) x .024 = $1,370. Since the annual expense of servicing the school district's checking accounts is $6,865, the bank would require an additional $5,495 from the school district as an annual fee to break even. However, with a $0 minimum balance requirement, the school district would experience 99 overdraft situations resulting in $2,188 in overdraft charges to the school district. Thus, the total cost of cash management to the school district, if it maintained a $0 minimum cash balance level, would be $7,683.

The savings interest earned by the school district if it maintained a $0 minimum balance level in the checking account would be $75,516. The cost of cash management to the school district of overdraft charges and annual banking fees of $7,683 is subtracted from the savings interest earned of $75,516, and the net gain in earnings to the school district is $67,833.

Simulations of the cash management operation of the school district using compensating cash balances in the depository account from $0 to $300,000 were investigated. As Table 1 displays,

the net earnings of the investment program of the school district is highest when the minimum compensating balance requirement is $0, and steadily decreases as the compensating balance requirement increases. However, the number of overdrafts in the checking accounts increase as the minimum balance requirement is lowered. These overdrafts undoubtedly would be reduced in an actual cash management situation because the cash manager has the ability to forecast the cash flows and requirements a few days in advance and can allow for large cash withdrawals. This the Miller-Orr cash management simulation cannot do.

As a result of this simulated cash management operation, it is apparent that business managers of the school districts should maintain a $0 minimum compensating cash balance in their checking accounts and negotiate an annual fee as compensation to the bank for its services. It is assumed that the school district can efficiently and actively invest its idle funds. At a minimum, the business managers should attempt to determine what the average daily balance in their districts' checking accounts is. Typically, it is much higher than the business manager realizes. Some attempt then should be made to lower this average checking balance level through investments.

In addition, there are a number of procedures a school district business manager should follow in dealing with a depository bank. First, the school district should "shop" for banking services. Often, banks provide many services of which school districts may be unaware, such as telephone transfers of cash between

the checking and savings accounts. Why should money be sitting in a checking account earning no interest when it could very easily be telephone transferred to a savings account to earn at least 5 per cent interest? Second, school districts should negotiate prices for the banking services they use, and the annual fee charged to the districts for their banking services. As was shown earlier, the school district would do well to maintain a $0 minimum balance in the checking account and invest the difference.

As a rule, if the earnings credit as determined by the bank earns less credit than the school district could earn through investing its money in a savings account, the district should negotiate a $0 minimum compensating cash balance, and pay an annual fee. If the earnings credit is equal to or more than the school district could earn in a savings account, the school district should maintain a minimum balance in the checking account such that the earnings credit equals the annual fee, thus minimizing the savings interest loss to the school district. In both cases, the prices charged by a bank for its services should be carefully investigated, and negotiated with the bank. Finally, the school districts should investigate the possibility of using short-term lines of credit to cover overdrafts. Banks can be cooperative because money loaned to school districts is tax exempt. Thus, school districts could receive favorable interest rates (i.e. 8 per cent) on such lines of credit.

The fear school districts have of overdrawing their checking

account is the cause of millions of dollars of lost interest revenues nationwide by maintaining excessively high average daily checking balances. The use of negotiated bank charges, short-term lines of credit, zero minimum checking balances, and investment of cash balances in short-term investments could gain for school districts thousands of additional dollars.[5]

FOOTNOTES

[1]Miller, M. and Orr, D., "A Model of the Demand for Money by Firms", Quarterly Journal of Economics, Vol. 80, August, 1966.

[2]Dembowski, F.L., "The Optimization of School District Cash Management", an unpublished dissertation, The University of Rochester, Rochester, N.Y., 1978.

[3]Miller and Orr, op. cit.

[4]These data used to calculate figures were obtained from the accounting records of the sample school district as reported in Dembowski, F.L., op. cit.

[5]See also, Dembowski, F.L., "Use Your Cash Management Potential", Educational Economics, July-August, 1978.